**Project Name:** RL-100KW Sedimentation Basin Complex-D&D-R

**Project Name (Expanded):** Richland Operations ARRA 100KW Sedimentation Basin Complex D&D [Cleanup, remediation, and removal as necessary of 526,503 square foot of mostly uncontaminated concrete settling basins, flocculation tanks, and miscellaneous water treatment equipment/headhouse structure designed to pretreat river waste for single flow reactor cooling]

**Project Type:** Building / Facility D&D Project Type

**Building Type:** B Typ 1

**Project Type Detail:** OTHER Type 1

**Supplementary Reference Documents:** PRC WBS Dictionary; Removal Action Work Plan for 100-K Area Ancillary Facilities (DOE/RL- 2005-26, Rev. 1)

**Site Context:**
All ARRA Projects are specific EM projects developed and executed between 2008 and 2011 in response to the American Reinvestment and Recovery Act. These projects were based on a total of 8+6+47 ARRA “Subprojects”, 8 managed by the Hanford Plateau Remediation Contractor (CH2M-Hill Plateau Remediation Company [PRC]), 6 managed by the River Corridor Contractor (Washington Closure Hanford [WCH]), and 47 managed by the Tank Operations Contractor (Washington River Protection Solutions [WRPS]), for a total cost of over $1.8B. The projects exist within larger ongoing site operations, depend on those larger elements for site services and support, and typically include costs for those services as indirect costs.

The historical Hanford Site mission was to reprocess reactor core material to produce plutonium for nuclear weapons and fabricate nuclear weapons components. It originally covered 670 square miles, and it has no future major non-environmental mission (there will be minor laboratory operations, management of waste disposal facilities and legacy controlled areas, and a gravity-wave observatory.

The two major activities associated with the DOE-EM mission are the facility decommissioning, environmental cleanup, and transuranic and solid waste management performed by PRC and WCH, and the vitrification/stabilization of high-level waste held in large below-ground tanks by WRPS. The Hanford EM ARRA scope has been divided into nine ECAS Level 4 Parent Projects based on the SRS organizational and PBS groupings:

**PRC ARRA Scope:**
- RL-PFP-R (WBS 011)
- RL-100K-R (WBS 041)
- RL-D&D-R (WBS 040)
- RL-Env Rest-R (WBS 030)
- RL-Waste Mgmt-R (WBS 013)

**WCH ARRA Scope:**
- RL-Acc Rem-R
- RL-RCC Waste Management Construction and Operations-R
- RL-618 Rem-R

**WRPS ARRA Scope**
- ORP ARRA Projects
**Project Name:** RL-100KW Sedimentation Basin Complex-D&D-R

**ECAS Level 4/Parent Project Context:**
The RL-D&D-R ARRA Parent Project grouping includes the ARRA ECAS Projects given below. These projects were administered under the PRC contract and were both decommissioning and environmental restoration projects that completely or partially remove facilities and clean up environmental media in the 100K area. All ARRA costs under this PBS (i.e., BPS 041) are contained in these ECAS Projects.
- RL-PFP 234-5 and Ancillary Facility D&D-D&D-R
- RL-100K Group 1,2,3 Small Facilities-D&D-R
- RL-100K Utilities Modification and Isolation-D&D-R
- RL-100KE Sedimentation Basin Complex-D&D-R
- RL-100KW Sedimentation Basin Complex-D&D-R
- RL-105-K ISS Acceleration-D&D-R
- RL-115KE Structure-D&D-R
- RL-117KE Structure-D&D-R
- RL-165KE Structure-D&D-R
- RL-1706KE-1706KER Structures-D&D-R
- RL-181KE Structure-D&D-R
- RL-181KW River Pump House-D&D-R
- RL-190KE Structure-D&D-R
- RL-190KW Structure-D&D-R
- RL-KW Basin Deactivation and Modification-D&D-R

**D&D Facility Data:**

**Facilities:**

<table>
<thead>
<tr>
<th>Building</th>
<th>Title</th>
<th>Area (SF)</th>
<th>In-Service Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>183.1KW</td>
<td>Headhouse</td>
<td>16,902.8</td>
<td>1955</td>
</tr>
<tr>
<td>183.2KW</td>
<td>KW Sedimentation Basins</td>
<td>292,343.80</td>
<td>1954</td>
</tr>
<tr>
<td>183.3KW</td>
<td>KE Filter Basin</td>
<td>90,958.0</td>
<td>1954</td>
</tr>
<tr>
<td>183.4KW</td>
<td>KE Reservoir &amp; Clearwells</td>
<td>119,298.6</td>
<td>1954</td>
</tr>
</tbody>
</table>

**Construction Details:**
The 183.1 KW Headhouse structure was steel frame with concrete shear walls. It had a concrete foundation and floor and also contained structural-steel frame walls with transite siding and a transite roof with built-up asphalt and gravel. The building was constructed of 2,404 m³ (3,143 yd) of concrete; 40,274 kg (88,789 lb) of miscellaneous iron; 44,635 kg (98,404 lb) of structural steel; 141,385 kg (311,701 lb) of reinforcing steel; 25.2 metric tons (27.8 tons) of miscellaneous steel; and 517 m² (5,565 ft²) of siding.

The 183.2KW Sedimentation Basins structure is reinforced concrete comprised of (6) Sedimentation basins and (6) Flocculation areas north of the Head House. The facility was open to air except dry wells, flash mixers, and distribution flume, which had reinforced concrete roofs. The basins were constructed with 19,690 m³ (25,753 yd³) of concrete; 18,264 kg (40,266 lb) of miscellaneous iron; 1,328,610 kg (2,929,083 lb) of reinforcing steel; and 4,808.6 m (15,766 ft) of pipe. The water-holding capacity of the sedimentation basins were 106,748,618 L (28,200,000 gal).
<table>
<thead>
<tr>
<th>Project Name:</th>
<th>RL-100KW Sedimentation Basin Complex-D&amp;D-R</th>
</tr>
</thead>
</table>

The 183.3KW Filter Basin structure was made from reinforced concrete; the exterior configuration was similar to a "daylight" basement. It was about 807 ft wide, 81 ft long, and 28 ft high. The basin was constructed of 8,947 m$^3$ (11,702 yd$^3$) of concrete; 820,231 kg (1,808,300 lb) of reinforcing steel; 6,870 m (22,539 ft) of copper tubing; and 18,370 kg (40,498 lb) of miscellaneous steel. Basins were open to air with checkerboard style roof. The facility comprised of (14) filter basins, a pipe gallery, an effluent flume, a waste flume, a distribution flume, a sedimentary flume, and a pipe tunnel. The facility attached to and north of 183.2 KW.

The 183.4KW Reservoir and Clearwells structure was constructed of reinforced concrete and pre-cast concrete roof planks covered by a 4 ply asphalt & gravel surface. The clearwell perimeter walls, floors, columns, beams, and strata were constructed of reinforced concrete. The roof deck was constructed of a pre-cast, reinforced-concrete slab covered with a 4-ply asphalt and gravel. The overall dimensions, which included the central pipe tunnel, were 246 m (807 ft) long by 47 m (154 ft) wide and 7 m (23 ft) deep. Each clearwell was 119 m (390 ft) long, 47 m (154 ft) wide, and 7 m (23 ft) deep. It was constructed of 19,990 m$^3$ (215,170 ft$^3$) of concrete; 664 metric tons (732 tons) of reinforcing steel; 19 metric tons (21 tons) of miscellaneous steel; 1,182.5 squares of roofing; 519 m (1,703 ft) of copper tubing; and 1,974 m (6,476 ft) of pipe. It abutted the 190 KW Pumphouse on its north side.

Facility Use:
The Hanford Site 100K Area was the location of the K East and K West reactor buildings and their support facilities. While the reactors were deactivated in the 1970-1971 timeframe, their fuel storage basins continued to operate and, since early 1976, were used to store irradiated fuel elements from the N-Reactor. Removal of the fuel from the basins was completed in October 2004. In 2008 the removal of found/scrap fuel and sludge from the K East Basin was completed, and the final removal of the attached Basin was initiated. Work to complete the 100K Area remediation included the D4 of support structures.

The 100 KW Sedimentation Basin was associated with treating the water from the Columbia River for use as single-pass reactor coolant for the 105 KW plutonium production reactor.

The 183.1KW Headhouse was the water quality center for the water treatment plant and contained equipment for metering raw water; chemical injection into raw, filtered, and process water; and for effluent and influent control for the filter plant. Raw water from the 181KW Pumphouse entered the basement of the headhouse through two 152-cm (60-in.)-diameter pipelines. At the headhouse, the two lines branched into three 91-cm (36-in.)-diameter distribution lines. The building was a single-story, T-shaped structure. The main wing contained the control equipment and personnel facilities, electrical equipment room, main control room, laboratory, lunchroom, locker and restroom, and chlorine equipment room. The remaining portion of the building housed the sanitary water filters, filter control board, water softeners, caustic soda and alum feeding pumps, activated silica batching and storage tanks, and silica batch control board. The basement of the main wing contained the raw water manifolds, metering stations, and the alum and activated silica injection points. The stem section of the basement contained the chemical heat exchangers, water glycol heat exchangers, circulating pumps, silica hatching and storage tanks, and air compressors. The headhouse controlled the operations of the chlorination of raw water, addition of coagulants to raw water, pH correction of filtered water, addition of
Project Name: RL-100KW Sedimentation Basin Complex-D&D-R

corrosion inhibitor to process water, and influent and effluent control.

The 183.2KW Sedimentation Basins were six parallel sedimentation basins. Water was fed from the flocculation basins into the sedimentation basins (GE 1952). Flocculation and subsidence basins consisting of open air-reinforced concrete basins, mixing chambers, agitators; flumes, etc. The 183.2KW Flocculation and Sedimentation Basins were designed to provide through-mixing of chemicals that were added to the water in the 183.1- KW Headhouse, coagulation of particles of suspended matter, and settlement of suspended solids. The facility was capable of handling a maximum total water flow of 156,600 gal/min. From the headhouse, water entered the flocculation basins and directly into the sedimentation basins. Detention time for the flocculators was 29 minutes to allow for adequate coagulation. The sedimentation basins contained six individual sections, three on each side of a central tunnel, interconnected through two distribution flumes. In addition, each basin discharge flume was equipped with twenty 60-cm (24-in.) disc valves. Water flowed over a weir through the disc valves and into the filter distribution flume located under the discharge flume. At normal water flow, 24 cm (9.4 in.) of water flowed over the weir.

The 183.3KW Filter Basin was designed to remove unsettled flocculant and other small suspended particles carried by the water from the sedimentation basins. The filter building contained three sections: flumes, filters, and pipe gallery. The flumes were a vertical bank of concrete conduits located adjacent to, and paralleling, the entire width of the sedimentation basins. The filters were immediately beyond the flumes and contained two beds and a central gullet separating the beds. Water flowed from the flumes through a 152-cm and 182-cm (60-in. and 72-in.) filter sluice gate into each filter gullet. A pipe gallery ran the entire length of the filter, which included the central tunnel. Filtered water flowed from the filters, through the filter effluent flumes toward the outer ends of the flumes, and delivered to the clearwells (183.4KW).

The 183.4KW Reservoir and Clearwells were designed to provide underground storage of filtered water. The two clearwells were each capable of holding 34,068,708 L (9,000,000 gal) of water. A pipe tunnel divided the two reservoirs on the centerline. A gravity pipe connection was located between the bottoms of the two halves of the reservoir. The pipe was located under the tunnel, with an overflow line from each reservoir connected to the main sewer.

Processes causing contamination:
All of these structures should have minimal radiological contamination since they are upstream of the reactor; it is possible that some of the pipe tunnels may have had minor contamination. The headhouse had transite siding and other asbestos materials associated with it due to its age.

Contaminants of concern (including extent of contamination by major contaminant):

<table>
<thead>
<tr>
<th>Building</th>
<th>Chemical Hazard</th>
<th>Location/Extent</th>
<th>Radiological Hazard</th>
<th>Location/Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>General buildings</td>
<td>Asbestos and incidental RCRA constituents</td>
<td>Asbestos as a insulating and interior materials; some exterior transite panels</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

Characterization indicated un-quantified hazardous construction material and potential chemical contamination.

D&D Project Execution
Site WBS Organization within the ECAS Project Scope:
The 100K Group 3 Structures Remediation activity for D4 of facilities included Project Management, Planning and Engineering, Project Support, Characterization, Deactivation, Dismantlement, Decontamination and Demolition. Deactivation (Cold and Dark process) and Dismantlement were not included in the Type 1 or Type 2 facility work scope. For Type 1 and Type 2 facilities, systems and other property were left in place and disposed of during Demolition.

Project Management provided overall direction and management to ensure a safe and compliant D4 process. The Planning and Engineering function provided the resources to ensure the integration of environmental, engineering and planning throughout the D4 work scope design, implementation and execution. Project Support provided resource assistance in the area of industrial hygiene, safety and health, material coordination and radiological controls management.

Characterization surveys were performed to analyze and develop Hazard controls for the remaining D4 activities. For Type 1 and Type 2 D&D, the characterization process included investigative reviews, inspections and if necessary sampling, to confirm planned worker health and safety and engineering controls were adequate as well as ensure waste designation and disposal pathways were available.

Decontamination was the removal, reduction or fixation of hazardous materials and contamination by various methods, including draining or flushing, chemical cleaning, mechanical cleaning or physical removal. Bulk radioactive and hazardous materials and equipment were removed. Selected components including glove boxes, tanks etc. were physically removed intact or size reduced for waste minimization as necessary. Decontamination also included removal of hazardous materials such as asbestos, lead, PCBs and mercury used in building construction. Decontamination included applying fixatives to the structure as well as the internals to process and HVAC systems prior to demolition as necessary. Dismantlement and Decontamination activities for a facility or structure were kept to a minimum whenever possible. The CHPRC approach was to bias D4 activities towards demolition with heavy equipment and disposal of structural components as solid waste.

Building demolition included structural demolition to slab-on-grade using conventional methods (e.g. track hoes w/hammers and concrete processors). Remaining facility equipment was size reduced with the structure and disposed of as waste. Water was used to suppress dust emissions during active demolition. If hazardous or radioactive materials were present, a fixative was applied at the end of each shift to the debris pile. Final site stabilization and inspections were performed after demolition of the structure was complete to ensure a safe and stable footprint remained.

Methods of execution:

Management: The scope was planned, managed, and executed as a single element that included all of the 100K activities. Management included technical and project oversight, planning, project controls, and quality assurance.

Regulatory: The work was done in compliance with Removal Action decision documents.
**Project Name:** RL-100KW Sedimentation Basin Complex-D&D-R

(Engineering Evaluation and Cost Analysis (EE/CA) and Action Memorandum) for structures and regulatory documents necessary to implement approved Records of Decision and or Removal Action Memorandum related to 100-K Ancillary Facilities. These documents were prepared prior to the start of this project; preparation was not included in project scope.

**Physical Approach:** The project activities were as follows:
- Abatement of asbestos from all friable sources (principally insulation and interior transite)
- Conventional demolition and loadout of remaining structure; large process equipment was size reduced as part of the building
- Removal of below-grade structure was required to a minimum depth of 3’ below final contour if the structure and surrounding soil met the cleanup standard. In practice this required significantly greater removals and significant backfill from local barrow areas.
- Final site restoration as appropriate

**Technologies:** Standard techniques were used for asbestos abatement and uncontaminated demolition.

**Activities self-performed:**
- All management and key technical positions along with a portion of the technical staff
- Waste management and disposal
- Used significant professional services contracted (i.e., seconded) labor inter-mixed with prime contractor staff
- All cold and dark/deactivation/utilities isolation activities
- Some of the demolition, size reduction of structure, and waste loading

**Activities subcontracted:**
- Excavation and site restoration activities
- Some of the demolition, size reduction of structure, and waste loading
- Equipment and logistics to the Material Support Contractor
- Sample analysis

**Issues that impacted the project:**
- None

**Scope Growth:**
No identified scope growth

**Notes Regarding Use of Data**
- The regulatory approach for the 100K area appears to allow for some below-ground structures to remain in place, probably below some depth below surface. It is unclear how much of the foundations of all of these structures, particularly uncontaminated ones, remained.
- The suite of 100K ECAS D&D projects completed most or the 100K support facility D&D – i.e., those areas not including the 105KE and 105KW reactors and their spent-fuel basins.
<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>While the areas for the buildings and structures are as given in project documentation, there was probably additional scope, such as removal of roads and fencing and general area re-contouring that was not specifically identified in project scoping documentation, perhaps to a greater degree than in other D&amp;D projects.</td>
<td></td>
</tr>
</tbody>
</table>